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THE DERIVATION OF THE MONTESSORI DIDACTIC APPARATUS¹

MATTIE CRUMPTON HARDY

Graduate Student, Department of Psychology, University of Chicago

"The didactic apparatus used by Montessori is not a set of mere separate toys. Neither are these materials used simply for the purpose of sense training. In the fullest sense they are the instruments of the psychological laboratory. The method of Dr. Montessori is the method of the experimental psychologist." Alongside of this quotation from an article of Carl Byoirs,² president of the House of Childhood in New York, we give the following from William Boyd's *From Locke to Montessori*:³ "Unlike Pestalozzi, she has not succeeded in evolving a coherent and unified scheme of thought out of her experimentation. Her so-called method is not really one method, but an aggregation of methods only loosely related in her own mind and capable of being employed in detachments from each other without any serious loss of virtue to any one of them."

The Montessori method as one unit or a composite of many units is interesting to the educator as a system of infant education, but to the psychologist, in addition to the psychological principles underlying it as a pedagogical problem, its outstanding features are its derivation, its stages of progress, and the method of procedure in the experimentation and final evolution. The purpose of this paper is not to deal with the problem of complexities of method, but to find the materials with which Dr. Montessori began her experiments, the sources of such apparatus, and to see wherein changes have been made from the original.

¹ Psychopathic Laboratory, University of Chicago. Communicated by H. C. Stevens.

² "Presentation on Montessori Material," *National Education Association Address and Proceedings* (1912), p. 615.

³ Page 138.

Maria Montessori's interest in the education of children began with her appointment as assistant physician at the psychiatric clinic in Rome. She was at that time doing special work along the line of children's diseases. Her trips to the insane asylum to secure patients for the clinic gave her a knowledge of the methods then prevalent for treating mental deficiency. That she might the better solve the problem of handling such cases at the clinic, she began a study of Séguin's and Itard's works. As a result she was convinced that mental deficiency in children called for education even more than for medical treatment. Her advocacy of this view at an important education congress in Turin in 1898 brought her an invitation from the minister of education to deliver a course of lectures to the teachers of Rome on the observation and training of defective children. These lectures led to the establishment of the State Orthophrenic School for the care of the feeble-minded. This school Montessori conducted herself, and by her personal efforts hopelessly retarded children from the elementary grades were allowed admission. The shift of her interest from the education of the feeble-minded to the problems of ordinary education was brought about by the striking success of her experiment with the defectives. She says, "While everyone was admiring the progress of my idiots, I was searching for the reason which could keep the happy, healthy children of the common schools on so low a plane that they could be equaled in tests of intelligence by my unfortunate pupils."¹ Believing that the same fundamental principles were involved in the education of the normal as those which she employed in her teaching of the defective, she gave up her work with the feeble-minded, and enrolled as a student of experimental psychology in the University of Rome. In 1907 the opportunity was given her for testing the validity of her set of didactic apparatus, the result of some years of psychological experimentation. Such changes as have been made in the apparatus since that time have been only minor adaptations.

Since those conversant with the problems of modern education are familiar with the Montessori apparatus, a description is here unnecessary, but for the sake of clearness it may be well to mention the kinds of materials she uses. The set of didactic apparatus

¹ *The Montessori Method*, p. 39.

includes dressing-frames for the development of co-ordinated movements of the fingers, solid geometric insets consisting of a series of cylinders of varying proportions; a series of blocks, color boxes, plane geometric insets, cylindrical sound boxes, and alphabet boxes.

The first questions to be answered in a study of Dr. Montessori's apparatus are: With what materials did she begin her experiments? and, What method did she pursue? The second question must remain unanswered so far as her experiments in the laboratory are concerned. As stated before, her first work in the educational field began in 1898 at the Orthophrenic School. Her material and the presentation of such during those two years were a careful application of Séguin's physiological method. As his treatment of scholastic subjects was very inadequate and unsatisfactory, Montessori attempted a new and original method of teaching reading and writing. Just what her materials were at this stage is very indefinite, but it is highly probable that the cut-up alphabet formed the basis for all future developments of this set. At this point began the psychological experimentation, which can be followed only by a comparison of the completed set of materials with the apparatus used in the beginning.

Since she had had previous experience with Séguin's materials it is a logical assumption that they formed the starting-point of her experiments. It will be interesting to see what traces they have left upon her finished handiwork.

Among the first educational gymnastics used in the Montessori method are the finger exercises with the dressing-frames. In Séguin's *Idiocy: Treatment by Physiological Methods* the hand is trained to precision by the finger gymnastics of buttoning, unbuttoning, and lacing and unlacing.¹ Montessori has added to these hooking, snapping, and tying. Her frames, as we know them, are attractive in colors, durable in fabric, and easily manipulated by the children, but they are based upon Séguinian principles and bear no special individual stamp.

The solid geometric insets consist of three series of wooden cylinders varying in height and diameter and fitting into correspond-

¹ Columbia ed., p. 87.

ing holes. Séguin's nail board was a board pierced with holes fitted with nails of the same dimensions. Here Dr. Montessori's experimental results show to good advantage. Séguin's descriptions of the nail board are limited and throw little light on the exact nature of the apparatus. It seems, however, that we are safe in assuming that his nails were either all alike or that they varied in only one dimension. The reason for this assumption is twofold: (1) he used only one board, and (2) the purpose of the exercise was the development of the hand. In Montessori's set the exercises are for differentiations in visual perception and are a preparation for the more difficult problems of fine adjustments.

The three series of blocks are all based upon the general principle of from large to small which is a special feature of several of Séguin's block exercises. The first of the series is the tower, a set of ten wooden cubes decreasing regularly in size. The play with these blocks consists in the superimposing of one block upon another from the largest to the smallest. In one of Séguin's exercises he states in very similar words the same purpose of his block work. The basic form, however, of this material, the cube, is a Froebelian idea and not Séguinian. The second of this series, the broad stair, is a set of ten rectangular wooden blocks in graduated dimensions of height and width, length remaining constant. The broad stair is the familiar Froebelian fourth gift of the kindergarten, usually called the "bricks," varying in the aforesaid dimensions. In these two sets of the series the Montessori apparatus differs from the Séguinian and the Froebelian in the regular decrease in size and in the construction arrangement planned; e.g., the doing of one and only one thing with each set.

Number 3 in the series, the long stair marked off into decimeters, is an exact duplicate of Séguin's "French meter"¹ for the appreciation of the size of bodies. The alternating of the colors blue and red in the divisions on each rod is Montessori's invention. The "French meter" set consisted of ten rods varying from one meter in length to one decimeter, each rod being carefully marked off into exact units. Séguin also worked out this same principle with yards and inches.

¹ Séguin, *Idiocy: Treatment by Physiological Methods*, p. 117.

In the teaching of color Séguin utilized cards, ribbons, marbles, and the like in similar colors, having the child assort them in pairs. Froebel used worsted balls of the six primary colors. Montessori has used Séguin's suggestion of conveying through the material only the property of color,¹ and also has employed his method of having the colors assorted in pairs. Here the similarities cease, for Montessori has elaborated this series to a very fine point of color discriminations, and in that she stands alone.

The materials used for teaching rough and smooth are original in arrangement only. Séguin in training the sense of touch had the child pass his hand over the bodies of various degrees of polish or resistance, such as grades of wood, marble slabs,² etc. Montessori's material is composed of strips of sandpaper, ranging from very coarse to very fine.

The fabrics or "stuffs" are pieces of velvet, silk, linen, cotton, and wool for gaining a knowledge of quality through the tactile sense. This set of the apparatus is identical with that of Séguin used for the same purpose.³ We find no new value given to the apparatus, only a refinement of the material itself.

The plane geometric insets are based upon the same formal principles that characterized the drawing of Pestalozzi, Froebel, and Séguin. Froebel's seventh kindergarten gift is a series of wooden geometric figures which are to be combined into forms for drawing. One of Séguin's gymnastic exercises for the hand was the adaptation of geometric figures to their respective hollow forms.⁴ These were also used in connection with painted geometric figures on cards for drawing purposes. Montessori has employed all of these factors in her work with this same apparatus.

In Séguin's method of teaching reading and writing, two alphabets were required, one composed of metal and the other of painted letters. In the Montessori system there are also two alphabets, one consisting of sandpaper letters and the other of colored paper letters. Dr. Montessori, however, has so far surpassed previous methods of teaching reading and writing, especially the latter, that

¹ Séguin, *Idiocy: Treatment by Psychological Method*, p. 115.

² *Ibid.*, p. 97.

³ *Ibid.*, p. 98.

⁴ *Ibid.*, p. 87.

this part of her work stands out as the most characteristic and original phase of the didactic apparatus.

TABLE I

Montessori	Séguin	Froebel
1. Dressing-frames Purpose: finger gymnastics	Materials for buttoning and lacing Purpose: finger gymnastics	.....
2. Solid geometric insets Purpose: Visual perceptions	Nail board Purpose: to exercise the hand to precision	.....
3. Series of blocks Purpose: auto-education (1) Tower cubes	.....	Purpose: construction (1) III. Kindergarten gift, the cubes
(2) Broad stair—rectangular prisms	.....	(2) IV. Kindergarten gift, the oblongs or "bricks"
(3) Long stair-rod	"French meter" Purpose: appreciation of size	.....
4. Sandpaper strips for rough and smooth Purpose: development of tactile sense	Bodies of various degrees of polish and resistance Purpose: development of tactile sense	.....
5. Stuffs—fabrics Purpose: quality through touch	Stuffs Purpose: quality through touch	.....
6. Color boxes Purpose: visual discriminations	Assorting of colored cards in pairs Purpose: visual discriminations	.....
7. Plane geometric insets Purpose: adjustment of fine movements and a knowledge of form	Plane geometric figures fitted to hollow receptacles Purpose: development of the hands and fingers	Geometric tablets Purpose: knowledge of form
8. Cylindrical sound boxes Purpose: discrimination of auditory perceptions	.....	.....
9. Alphabet boxes — sandpaper and cardboard Purpose: teaching reading and writing	Metal and painted alphabets Purpose: teaching reading and writing	.....

The sound boxes belong exclusively to Montessori, so far as we can discover. Séguin taught the discrimination of noises to defective children separately, and his suggestions are few and vague. Itard recommended the gradation of sounds of the bell and the drum for the training of auditory perceptions. But the

boxes containing different kinds of substances for the differentiations of noises are essentially a Montessorian device.

As a summary of the preceding facts we give Table I, showing the relation of the apparatus used by Montessori, Séguin, and Froebel.

From the foregoing correlations we may draw the following conclusions:

1. Every part of the Montessori apparatus, with one exception—the sound boxes—has been derived directly from the Séguinian didactic materials used by Séguin in the education of idiots.

2. The majority of the apparatus has only been refined and made more attractive and more durable; it has not been changed in form.

3. Those parts which seem to differ from the original in form have merely been elaborated and made more definite and practical; therefore they have not been evolved into new and characteristic materials.

4. The purposes for which the apparatus was planned by the originator, Séguin, and those for which Montessori uses the materials are identical in the majority of steps.

5. The sound boxes for auditory discriminations, the color boxes for fine distinctions of color differentiations, and the evolution of the set of materials for the effective teaching of writing are the principal materials which show the result of independent psychological experimentation.

6. The Montessori didactic apparatus is neither original in form nor in application, though the systematizing of the methods of presentation is due to Dr. Montessori alone.